Dynamic modelling of nitrous oxide emissions from three Swedish sludge liquor treatment systems - DTU Orbit (08/11/2017)

Dynamic modelling of nitrous oxide emissions from three Swedish sludge liquor treatment systems

The objective of this paper is to model the dynamics and validate the results of nitrous oxide (N_2O)emissions from three Swedish nitrifying/denitrifying, nitritation and anammox systems treating real anaerobic digester sludge liquor. The Activated Sludge Model No. 1 is extended to describe N_2O production by both heterotrophic and autotrophic denitrification. In addition, mass transfer equations are implemented to characterize the dynamics of N_2O in the water and the gas phases.The biochemical model is simulated and validated for two hydraulic patterns: (1) a sequencing batch reactor; and, (2) a moving-bed biofilm reactor. Results show that the calibrated model is partly capable of reproducing the behaviour of N_2O as well as the nitritation/nitrification/denitrification dynamics. However, the results emphasize that additional work is required before N_2O emissions from sludge liquor treatment plants can be generally predicted with high certainty by simulations. Continued efforts should focus on determining the switching conditions for different N_2O formation pathways and, if full-scale data is used, more detailed modelling of the measurement devices might improve the conclusions that can be drawn.

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